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ceedings of the U. S. National Museum, is a valuable contribution to our knowledge of the flora of the Southwest.—In a twenty-four page pamphlet, reprinted from Studies in the Biological Laboratory of the Johns Hopkins University, Dr. William Trelease records his observations on several Zoöglææ and related forms. The following new species are described and figured, viz: *Bacterium candidum*, *B. aurantiacum*, *B. luteum*, *B. chlorinum*, *B. incarnatum*. A valuable feature of the work recorded is its biological character. One lays down the pamphlet with the feeling that much work can be done upon the basis of Dr. Trelease's observations. This record is an incentive to further study.—Dr. Trelease's inaugural address, delivered upon his accession to the directorship of the Henry Shaw School of Botany, in St. Louis, November 6, is an admirable presentation of the claims of botany to a place in general education.—The January *Botanical Gazette* will contain a portrait and biographical sketch of Dr. Asa Gray, together with some of the poems, congratulatory addresses, etc., which were sent on his birthday, November 18, 1885.

ENTOMOLOGY.

RECENT DISCOVERY OF CARBONIFEROUS INSECTS.—A rich deposit of Carboniferous insects has been discovered at Commentry, in the department of Allier, France, and has been worked up by C. Brongniart, whose work, however, has not yet been received. From a notice of his paper in the *Entomologische Nachrichten* for November last, we learn that over 1300 specimens of insect remains, not wings alone but also the bodies, have been preserved to science.

While an exclusive study of the shape and venation of the wings must necessarily have led to many errors, the discoveries at Commentry show that insects which are regarded as among the most ancient are still surprisingly like those of the present time, and only differ in comparatively unimportant respects.

In the oldest strata, the Silurian, has been found but a single winged insect, the still very problematical *Palæoblattina douvillei* Brong.; in the Devonian only the six species of insects, as to whose relations excellent naturalists, such as S. H. Scudder and H. Hagen, have very different views, and relative to which discussion has not yet closed. Before the present discovery only 120 specimens of Palæozoic insects were known.

From the Carboniferous formation of Commentry Brongniart has obtained over 1300 examples. Among them occurs the first fossil Thysanuran, represented by forty-five specimens. It differs from existing forms only by having a single caudal filament, and exclusive of this is 15 to 22^{mm}. long, and is generally similar to *Machilis*; it is named *Dasyleptus lucasi*. Numerous representatives of our recent Acridians are brought together under the

name of Palæacridiidea, and divided into three groups with seven, mostly new, genera.

The types so discovered belong to the three orders of Orthoptera, Neuroptera, and Hemiptera, also to the Heterometabola of Packard and of Scudder, while the Metabola are still entirely wanting. But of the Heterometabola the Coleoptera are entirely wanting.

Between the Orthoptera and Neuroptera is placed the new order of Neurorthoptera, with the sub-order of Neurorthoptera in a special sense, and the Palæodictyoptera of Goldenburg; the first of these suborders embraces two families, the progenitors of the recent Phasmidæ, the Protophasmida, with genera containing the colossal forms: Protophasma, Lithophasma, Titanophasma and Archeogryllus, and the Stenaropterida with three genera.

To the Palæodictyoptera belong the Stenodictyoptera with the genera Eugeneon Gold., Haplophlebium Scudd., Goldenbergia Scudd., Dictyoneura Gold., and two new genera wholly without recent representatives; in addition, the Termes-like Hadrobrachypoda, with Miamia Scudd., and the new genus Leptoneura, besides the wholly extinct Platypterida provided on the end of the abdomen with two filaments, which belong to the three genera, Lamproptilia, Zeilleria and Spilatera.

In the Pseudoneuroptera Brongniart places the wholly extinct family of Megasecopterida, with eight new genera whose relatives in part bore respiratory appendages on the abdomen, a group to which also belongs de Borre's much-discussed *Breyeria borinensis*. Also a family of Protodonata, regarded as the forerunners of the recent Libellulidæ, with Protagrion n. g. Likewise, thirdly, the family of Homothetida Scudder; also, new families, the forerunners of the recent ones, viz: the Protephemerina, Protoperlida and Protomyrmeleonida.

Of the Hemiptera five different genera belonging to the Homoptera have been found, among which belongs, in Brongniart's opinion, *Phthanocoris occidentalis*, erroneously regarded by Scudder as a Heteropteron.

PLATEAU'S EXPERIMENTS ON VISION IN INSECTS.—The question whether insects can distinguish the form of objects is asked by Professor Plateau in a communication to the Royal Academy of Belgium. He rejects the mosaic theory of vision proposed by Müller, following Exner in his essay on the perception of movements, and on the theory of compound eyes, presented to the Vienna Academy in 1875.

The work of Exner, says Plateau, leads to the theoretical deduction that insects and other Arthropods possessing compound eyes do not distinguish the form of objects. Exner supposes that, in the Articulates and in many other animals, vision operates in a different way from that generally admitted, and

consists mainly in the perception of movements. He enumerates, in support of his thesis, a series of important facts. In man the power of plainly distinguishing forms only belongs to the central part of the retina, while we perceive movements very well by the aid of the peripheral region of this sensitive layer.

Most animals, both vertebrates and invertebrates, seem but little impressed by the form of their enemies or of their victims, but their attention is immediately excited by the slightest displacement. Hunters, fishermen and entomologists have made in this respect numerous and demonstrative observations.

Finally, though the production of an image in the faceted eye of the insect or the crustacean seems impossible, we can easily conceive how the Arthropod can ascertain the existence of a movement. Indeed, if a luminous object is placed before a compound eye, it will illuminate a whole group of simple eyes or facets; moreover the centre of this group will be clearer than the rest. Every movement of the luminous body will displace the center of clearness; some of the facets not illuminated will first receive the light, and others will reënter into the shade; some nervous terminations will be excited anew, while those which were so formerly will cease to be.

In résumé, careful physiologists, relying on the structure of the compound eyes of Arthropods, admit that these animals do not see the form of objects, but only perceive colors and movements. Their faceted eyes are not complete visual organs, but simple organs of orientation.

Plateau then details the experiments he made to determine this question; and which we cannot well abstract. He calls attention to one result of his experiments: that insects only utilize their eyes to choose between a *white* luminous orifice in a dark chamber, or another orifice, or group of orifices, *equally white*. They are guided neither by odorous emanations, nor by differences of color. A fact which will certainly astonish all entomologists and likewise surprise the experimenter himself is, that bees have as bad sight and comport themselves almost exactly as flies.

From numerous experiments on Diptera, Hymenoptera, Lepidoptera, Odonata and Coleoptera, Plateau comes provisionally to the following conclusions:

1. Diurnal insects have need of a quick, strong light, and cannot direct their movements in partial obscurity.
2. In diurnal insects with compound eyes, the simple eyes offer so little utility that it is right to consider them as rudimentary organs.
3. Insects with compound eyes do not notice differences of form existing between two light orifices, and are deceived by an excess of luminous intensity as well as by the apparent excess of surface. In short, they do not distinguish the form of objects, or, if they do, distinguish them very badly.

THE DIVISION OF THE SEXES OF HYMENOPTERA.—We translate in a rather clumsy way Fabre's interesting article on this subject, published in the *Annales des Sciences Naturelles* (Tome xvii, Nos. 5 and 6). The entire article should be read to understand the subject.

The Osmias, the Chalicodomas and, as the closest analogies show, a great number of other honey-making Hymenoptera, arrange their egg-laying in female at first and then in male cells, when the two sexes have a different size and require unequal quantities of nourishment. If there is an equality of size between the two sexes, the same succession may exist, but less constantly.

This binary arrangement disappears when the place chosen for the nest is not large enough for the entire egg-laying. Then partial egg-layings occur, composed both of females and of males, and in harmony, as to their number and distribution, with the disengaged space.

To be able to give to each larva the room and the nourishment which it needs according to whether it is male or female, the mother decides the sex of the egg she is about to lay. According to the conditions of the home, often the work of another or a natural habitation slightly or not at all modifiable, she lays at her will either a male or a female egg. The division of the sexes is subject to her will.

The same prerogative belongs to the carnivorous Hymenoptera, the sexes of which have a different shape, and therefore need one more, the other less food. The mother must know the sex of the egg she is about to lay; she must dispose of the sex of this egg so that each larva shall obtain the right amount of food.

In a general way, when the sexes are of different size, every insect which collects the living prey, which prepares or at least chooses an abode for its offspring, must decide the sex of the egg to satisfy without error the conditions imposed upon it.

It remains to tell how this elective determination of the sexes is made. I do not absolutely know, I have never understood this delicate problem but attribute it to some fortunate circumstance which it is necessary to know or rather to watch for.

ENTOMOLOGICAL NEWS.—From a series of experiments by Professor Graber, says *Nature*, Oct. 22, relating to the effects of odorous matters on invertebrate animals, it appears probable that in the case of many insects neither the antennæ nor the palpi can be absolutely pronounced the most sensitive organ of smell, inasmuch as the one organ is most sensitive to some odorous matters, and the other for others.—Apropos of Hickson's account of the structure of the eyes of insects in our last number, we may say that, in 1883, B. T. Lowne published a paper in the Proc. Roy. Soc. London, of which an abstract has been published by Dr. Mack in *Psyche*, as follows: The author claims four forms

of eyes: simple ocellus, compound ocellus (larval insects), aggregate (Isopoda) and compound eye. A brief description of each is given. Discarding all previous theories of vision by compound eyes, it is held that "a continuous picture, a mosaic of erect magnified central portions of the several subcorneal images, falls upon the retina."—Kraepelin (*Ueber die geruchsorgane der Gliederthiere*), *Osterprogram der Realschule des Johanneums, Hamburg*, 1883, gives an historical sketch of the olfactory organs of Arthropods, followed by a bibliographic list (59 numbers) grouped according to the languages in which the articles were written. He criticises the results of others, and compares them with his own observations on several crustacea, beetles, chrysopa, Orthoptera, butterflies, flies and Hymenoptera (*Psyche*, 296).—In the *Annales des Sciences Naturelles* (xvii, Nos. 5 et 6) is an interesting article by J. H. Fabre on the division of the sexes in the Hymenoptera; it gives the results of many years observations on the subject which we refer to more at length elsewhere.—The *Transactions of the American Entomological Society* (xii, No. 2) contain several papers by Dr. Horn, viz: Descriptions of new North American Scarabaeidæ; Contributions to the Coleopterology of the United States; Descriptions of new Cerambycidæ, with notes; Synopsis of the Throscidæ of the United States; while Mr. F. Blanchard discusses the species of *Canthon* and *Phanæus* of the United States, adding notes on other genera; and Mr. W. H. Ashmead remarks on the cynipidous galls of Florida, giving descriptions of new species.

ZOOLOGY.

LIVING AND DEAD PROTOPLASM.—Dr. Oscar Loew read an important paper before the British Association on a chemical difference between living and dead protoplasm. Protoplasm, it was found, contains certain aldehyde groups, which account for the extreme mobility and readiness of change in living protoplasm. These aldehyde groups can be reduced by alkaline silver solution. *Spirogyra*, one of the lower algæ, acts on this solution in a peculiar way. Living protoplasm reduces the salt, while dead protoplasm does not. The specific gravity of the protoplasm of *Spirogyra* was increased, and was found to contain silver deposited in its interior. *Argyria*, or the effect of nitrate of silver on the human subject in certain diseases, was found in these algæ. Thus was shown a specific chemical difference between living and dead protoplasm. Ordinary poisons, such as prussic acid and strychnine, seem to have no particular effect on lower organisms, while the poison irresistible by all protoplasm is hydroxylamyl. Professor Burdon-Sanderson said that this investigation had more importance than might at first appear, for it had arisen out of the epoch-making paper of Pflüger. Pflüger concluded that there must be a chemical change in the transition from living to dead